© Entomological Society of Indochina
អ្នកជំនាញខាងជាណកសាស្ត្រឥណ្ឌូចិន
The Indochina Entomologist
OPEN ACCESS
New Taxon
ICE, 1 (41): 409–417 (2025)
ISSN (Online) 3065-1107
www.indochinaentomologist.com

https://doi.org/10.70590/ice.2025.01.41
http://zoobank.org/urn:lsid:zoobank.org:pub:0E2DC30F-1303-4FE5-BDFF-4ACD09473169

A new subspecies of *Dacalana cotys* (Hewitson, [1865]) from China (Lepidoptera: Lycaenidae)

Hua-Zhao LI[1*], Zhe LIU[2], Zhen-Jun WU[3] & Jia-Ling LI[4]

[1]Lushuiqingshan, Aba, Sichuan, P.R. China;
https://orcid.org/0000-0002-3656-193X; lhz_euphony@foxmail.com
[2]Sanya, Hainan, P.R. China;
https://orcid.org/0000-0001-7036-7164; 149058809@qq.com
[3]Fuzhou, Fujian, P.R. China;
https://orcid.org/0009-0005-3395-3881; 50427468@qq.com
[4]Wu Zhishan Division of Hainan Tropical Rainforest National Park Bureau, Wuzhishan, Hainan, P.R. China;
https://orcid.org/0000-0003-3560-4798; 19071300110003@hainanu.edu.cn
*Corresponding author

Abstract: The population of *Dacalana cotys* (Hewitson, [1865]) from China is described as a new subspecies, namely *D. c. wui* H-Z Li, Liu & Wu **ssp. nov.**, based on morphological characters. The adults, genitalia, diagnosis, phylogenetic position of the new subspecies, along with taxonomic discussion and a distributional map of *D. cotys*-group are provided.

Keywords: Theclinae, Iolaini, genitalia, phylogeny

中国考达灰蝶一新亚种（鳞翅目：灰蝶科）

李华钊 [1*]，刘哲 [2]，吴振军 [3] & 李佳灵 [4]

[1]绿水青山，阿坝藏族羌族自治州，四川省，中国
[2]三亚市，海南省，中国
[3]福州市，福建省，中国
[4]海南热带雨林国家公园管理局五指山分局，五指山市，海南省，中国
*通讯作者

摘要：基于形态学特征，我国考达灰蝶 *Dacalana cotys* (Hewitson, [1865])种群被描述为一个新亚种，即考达灰蝶华南亚种 *D. c. wui* H-Z Li, Liu & Wu **ssp. nov.**。本文提供了该新亚种的成虫形态、外生殖器图、鉴别特征和系统发育位置，并附有考达灰蝶种团 *D. cotys*-group 的分类学讨论和分布图。

关键词：线灰蝶亚科，瑶灰蝶族，外生殖器，系统发育

Citation: Li H-Z, Liu Z, Wu Z-J & Li J-L 2025: A new subspecies of *Dacalana cotys* (Hewitson, [1865]) from China (Lepidoptera: Lycaenidae). *The Indochina Entomologist*, 1 (41): 409–417. [李华钊，刘哲，吴振军 & 李佳灵 2025: 中国考达灰蝶一新亚种（鳞翅目：灰蝶科）. 中南半岛昆虫学家, 1 (41): 409–417.]
https://doi.org/10.70590/ice.2025.01.41

Accepted by Cheng-Bin WANG: 3.V.2025; published online: 3.V.2025

Copyright Hua-Zhao LI *et al*. This is an open access article distributed under the terms of the Creative Commons Attribution License (CCBY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

The Oriental lycaenid genus *Dacalana* Moore, 1884 is a speciose group, comprising more than 20 described species, and can be separated from allied genera by a notable white band on the underside of both wings (Huang 2022; Saito & Inayoshi 2022). Despite the species within this genus exhibit superficial similarities, the *cotys*-group is easily distinguished from its congeners, characterized by the absence of male brands on the forewing upperside (Corbet 1938). Currently, only two species are recognized in this group from the mainland Oriental Region, i.e., *D. cotys* (Hewitson, [1865]) distributed in the Indo-Chinese subregion and *D. cremera* (de Nicéville, 1894) from the Malayan subregion (Eliot 1969, 1984; van der Poorten & van der Poorten 2020; Huang 2022; Inayoshi 2024).

At present in China, *D. cotys* stands as the only representative of the *cotys*-group, with its distribution restricted to Hainan Island (Wang & Fan 2002). Although first discovered as early as the end of the last century, this species in China remains poorly documented with only a few subsequent records in Hainan Is. (Gu & Chen 1997; Zhou *et al.* 2022). Moreover, the taxonomic status of *D. cotys* in China had not been studied until Huang (2022) confirmed the conspecificity between the Hainan population and that from Indochina through genital comparisons. However, illustrations from previous works clearly demonstrate that *D. cotys* from Hainan displays a narrower white band on the wing underside (Gu & Chen 1997; Huang 2022). Additionally, recently discovered continental *D. cotys* in Guangxi also bears a narrow white band, suggesting that the population from China are different from that in Indochina.

Therefore, the present study aims to re-examine the population of *D. cotys* from China and to describe it as a new subspecies.

Material and methods

A series of *Dacalana cotys* from Hainan and Guangxi was examined in the collection of H-Z Liu (CZL) and Z-J Wu (CZJW). In addition, *D. cotys* were also analyzed by examining the individuals illustrated in previous works, including (i) the Hainan population figured in Gu & Chen (1997), Wang *et al.* (2020), Huang (2022), Zhou *et al.* (2022), and (ii) the continental population figured in Hewitson (1863–1878), Tytler (1915), Seitz (1926), D'Abrera (1986), Osada *et al.* (1999), Kimura *et al.* (2014), Huang (2022), Saito & Inayoshi (2022), Inayoshi (2024), Kunte *et al.* (2025). All aforementioned literature also serves as a source of distributional data, with some additional records from de Nicéville (1890), Fruhstorfer (1912), Godfrey (1919), Evans (1932), Singh & Chib (2015), Varshney & Smetacek (2015), van der Poorten & van der Poorten (2020), and Bortamuly & Dey (2022). The dates on publications of Hewitson (1863–1878), Moore (1880–1881), and Seitz (1927) were based on Hemming (1938) and Griffin (1936; 1939), respectively. The definition of zoogeographical regions was from Wallace (1876). The holotype of the new taxon described in this study will be deposited at the Chongqing Museum of Natural History, Beibei, Chongqing (CMNH).

Mitochondrial *COI* and nuclear *EF-1α* were chosen for phylogenetic analysis. The primers LepF/LepR (Tm = 55 °C) were used for *COI* amplification, while EF135/EF684 (Tm = 60°C) and EF51.9/EFrcM4 (Tm = 55°C) were employed for *EF-1α* (Monteiro & Pierce 2001; Kandul *et al.* 2004; Hajibabaei *et al.* 2006). The DNA extraction was performed by Beijing Tsingke Biotech Co., Ltd. (Beijing, China). PCR was applied in a 50 μL system containing 25 μL of Mix (2*T8 High-Fidelity Master Mix, Beijing Tsingke Biotech Co., Ltd.), 5 μL of gDNA, 16 μL of dH_2O, and 2 μL of each forward and reverse primer. The thermal cycling protocol of PCR included an initial denaturation at 98 °C for 3 min, followed by 35 cycles of denaturation at 98 °C for 10s, annealing at 50 °C for 10s, and elongation at 72 °C for 10s, with a final elongation at 72 °C for 5 min.

The sequence alignments were generated by Clustal W with manual refinement in MEGA 11 (Tamura *et al.* 2021). Maximum likelihood (ML) phylogenetic analysis was performed on the IQ-TREE web server under the GTR + G4 substitution model (Nguyen *et al.* 2015; Trifinopoulos *et al.* 2016). The dataset incorporated two molecular markers, *COI* and *EF-1α* genes, each analyzed as an independent partition. All other parameters retained their

default configurations. In addition to the molecular data provided by the present study, additional sequences were retrieved from NCBI GenBank and their accession numbers can be found in Figure 5.

Results

Beyond the name-bearing type from Nepal, two taxa related to *D. cotys* were described based on some external differences. The first is *capusa* Fruhstorfer, 1912, established as a subspecies of *D. cotys* from Nias Is., Indonesia, a distribution significantly isolated from the species' known range (Fig. 4). However, both the zoogeographic distinctions and the genital differences suggest it is not conspecific with *D. cotys* (Corbet 1938; Eliot 1984). The second taxon, *cotoides* Tytler, 1915, was originally described as a distinct species from N.E. India, but later synonymized with *D. cotys* without dispute (Evans 1932). In fact, many external diagnostic characteristics of *cotoides* fail to meet species-level differentiation without examining its copulatory apparatuses (Saito & Inayoshi 2022). Thus, contemporary consensus recognizes *D. cotys* as lacking subspecific division, notwithstanding the taxonomic status of both *cotoides* and *cotys* remains insufficiently studied and requires future revisions (Huang 2022; Inayoshi 2024).

In S. China, the northeasternmost range of this species, individuals exhibit a narrower white band on the wing underside compared to populations distributed from India to Indochina (Figs 1, 2). Interestingly, two distinct phenotypes of *D. cotys* occur sympatrically in Guangxi: the first (DCW1–3) closely resembles the nominal *cotys* except for its narrower white band, while the second form (DCW4–5) is not only with a slenderer white band, but also displays subtle differences in genitalia (Figs. 1, 2). However, the phylogenetic tree constructed by *COI* and *EF-1α* reveals negligible genetic distance between the two forms (Fig. 5). Coupled with their collection dates, these findings support interpretation of the phenotypic variations as seasonal dimorphisms, the first of which corresponds to the spring form and the second represents the autumn form. Therefore, given the superficial distinctions across seasons, we hereby regard the population of *D. cotys* from China as a new subspecies, which is described below.

Dacalana cotys wui H-Z Li, Liu & Wu ssp. nov. 考达灰蝶华南亚种

https://zoobank.org/15D75101-F8AC-47D0-83CB-859E43B352DD

(Figs 1 for adults, 2 for genitalia, 3 for diagnosis, 4 for distribution, 5 for phylogeny)

Dacalana cotys: Gu & Chen (1997): 258, fig. 320 for '♂' [recte ♀] and ♀; Gu (2002): 703 for list; Wang & Fan (2002): 180 for list; Wang *et al.* (2020): 244, a mating couple; Huang (2022): 17 for a remark, figs. 34 for ♂ and ♀, 52, 72, 125, 126 for genitalia; Zhou *et al.* (2022): 111 for ♀, copied by Gu *et al.* (2024).

Dacalana penicilligera: Saito & Inayoshi (2022): 41 [misiden.].

Holotype: ♂, Fangchenggang, Guangxi, China, 13.III.2025 (DCW4; will be deposited at CMNH)

Paratypes: ♂, Fangchenggang, Guangxi, China, 18.III.2025 (DCW5; CZL); ♂ and ♀, Fangchenggang, Guangxi, China, 13.X.2024 (DCW2–3; CZJW).

Diagnosis. The new subspecies can be distinguished from the nominotypical *cotys* by (Fig. 3):

(1) In spring form, the underside white band is narrower.

(2) In autumn form, the underside white band is rather slenderer.

Distribution. S. China (Guangxi, Hainan).

Etymology. The subspecific name is dedicated to Mr. Min-Jin Wu for kindly sharing research materials with the first author over the years.

Remarks. (1) Notably, the nominal subspecies from India and Indochina show reduced seasonal polymorphism compared to the new subspecies (Kimura *et al.* 2014; Kunte *et al.* 2025) (Fig. 3). (2) The valvae of the new subspecies are somewhat variable with its dorsal margin humped in those from Guangxi (spring form), while more or less straight in those from Guangxi (autumn form) and Indochina, and concave in those from Hainan (Huang 2022; Saito & Inayoshi 2022) (Figs 2, 3). (3) The Hainan specimen examined herein is excluded from paratype

designation owing to the absence of molecular data.

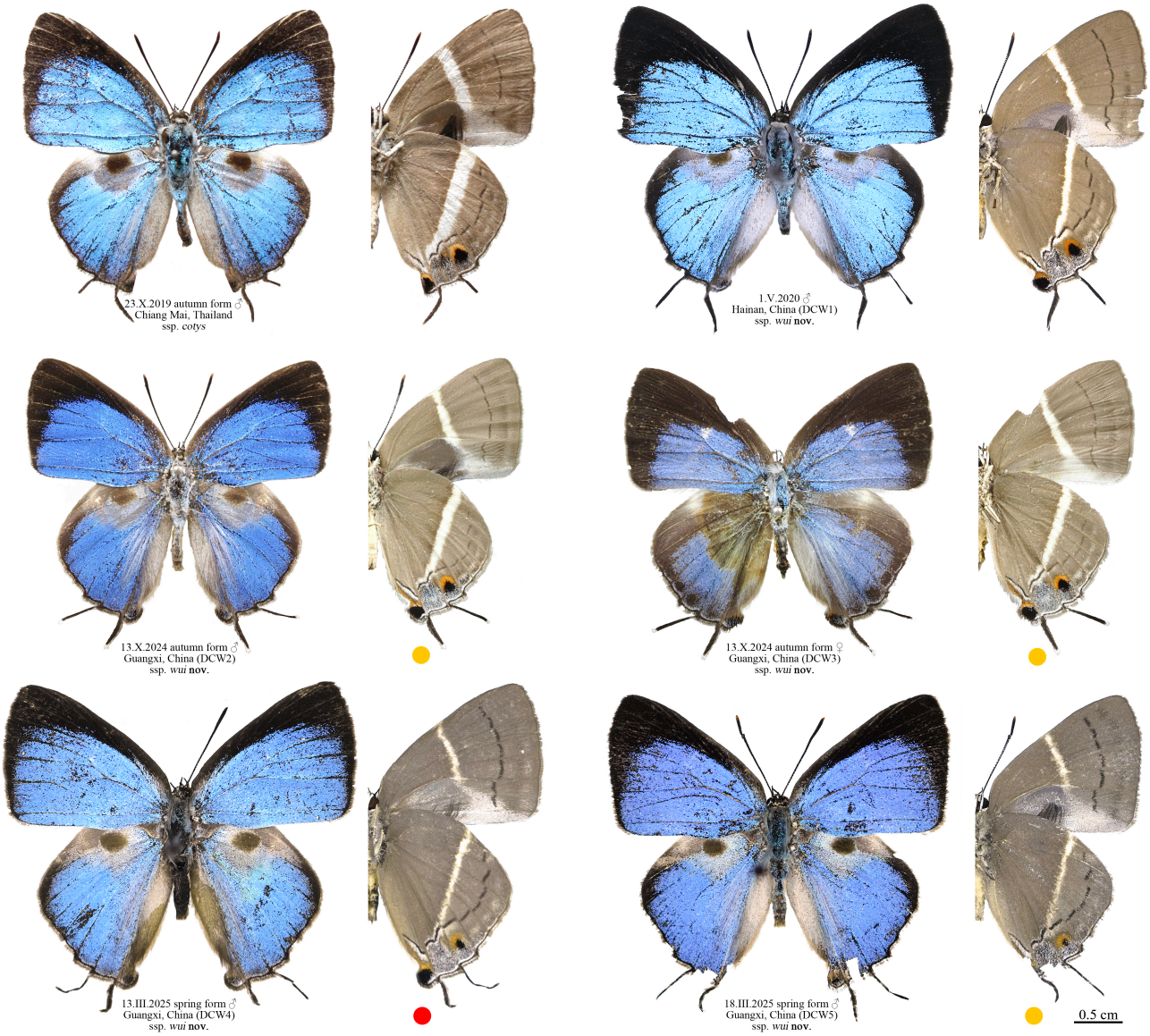

FIGURE 1. Habitus of *Dacalana cotys* from China and adjacent area.

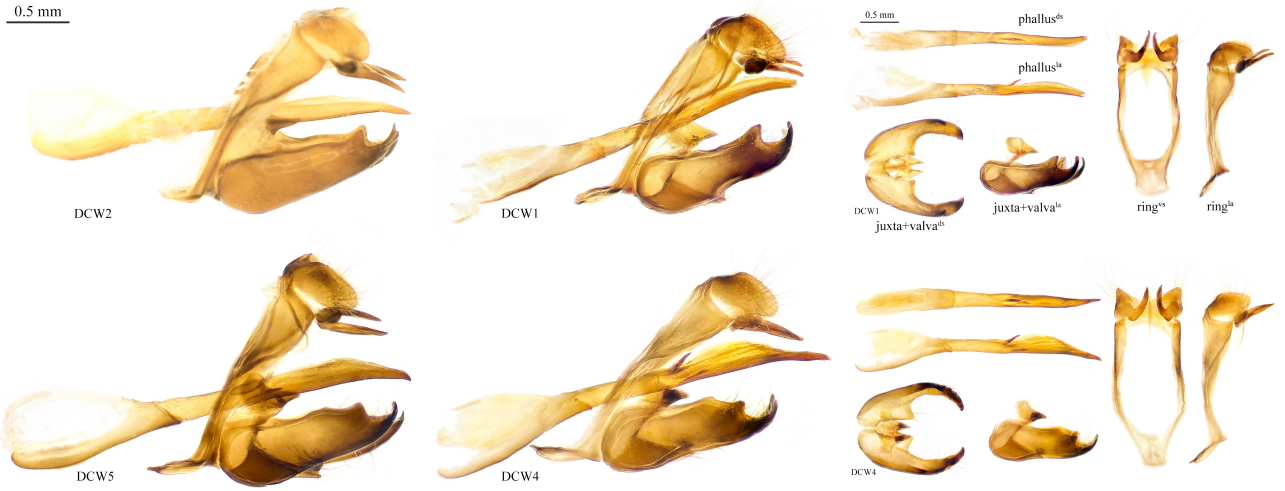

FIGURE 2. Genitalia of *Dacalana cotys wui* **ssp. nov.** la = lateral view, ds = dorsal view, vs = ventral view.

Discussion

The population of *D. cotys* from N.E. India, near its type locality, possesses a slightly different valva compared to those from Indochina and China (Corbet 1938). Specifically, the valva of the Indian population illustrated by Corbet (1938) has a straight inner margin, whereas those of the Chinese and Indochinese populations curve inward (Fig. 3). This discrepancy suggests that either the hand-drawing of Corbet (1938) is inaccurate or the populations from Indochina and China actually represents a distinct species from the true *D. cotys*. But in either case, the Chinese population clearly constitutes, at least, an independent subspecies based on its narrower white band (Fig. 3).

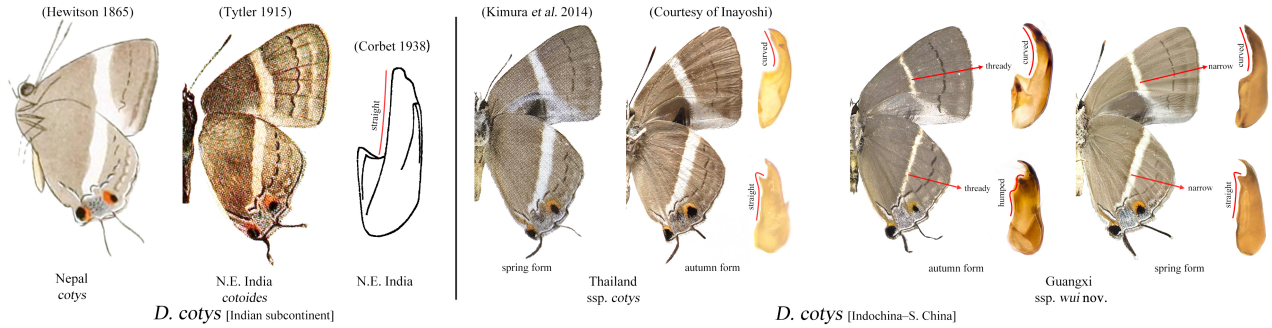

FIGURE 3. Diagnosis of *Dacalana cotys* from diverse localities.

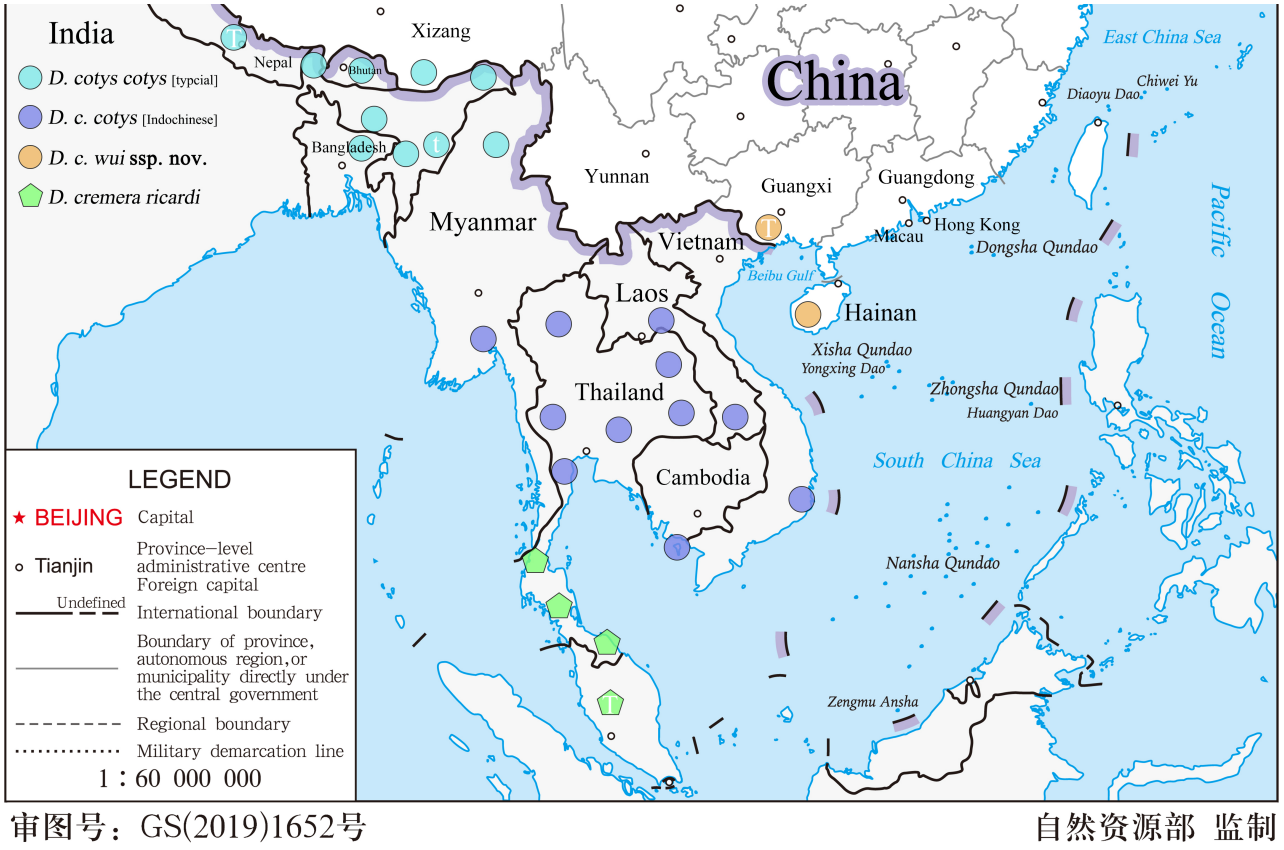

FIGURE 4. Distribution map of *Dacalana cotys*-group in the mainland. T and t = type locality of subspecies accepted and synonymized respectively. Source from references in Material and methods.

Although Moore (1884) transferred *cotys* from its original genus to *Dacalana* that he newly established, de Nicéville (1890) soon after contested Moore's arrangement by the reason of distinctions on forewing veins and upper male brands. He argued that the members of this genus should be subdivided into three different genera,

reclassifying *cotys* under the genus *Ancema* Eliot, 1973 (Distant 1882–1886; van der Poorten & van der Poorten 2020). Additionally, some other researchers, such as Evans (1932), even treated all those genera as synonyms of *Pratapa* Moore, [1881]. However, the generic independence of *Dacalana* is now unquestionable, as it is well supported by the phylogeny constructed using both morphological characters and molecular data, with the difference in forewing venation recognized as intraspecific variation (Huang 2022; Saito & Inayoshi 2022; Kawahara *et al.* 2023). Furthermore, the present study provides additional molecular evidence by incorporating *COI* and *EF-1α* sequences of *D. cotys*, which demonstrates it forms a clade sister to other *Dacalana* species rather than clustering with the genera to which it was once assigned (Fig. 5). Although molecular data are lacking for most members of this genus, this phylogenetic result provides partial support for the current view that *Dacalana* is a good genus, with *cotys*-group and *Arrhenothrix* de Nicéville, 1890 treated as its intrageneric group and synonym respectively.

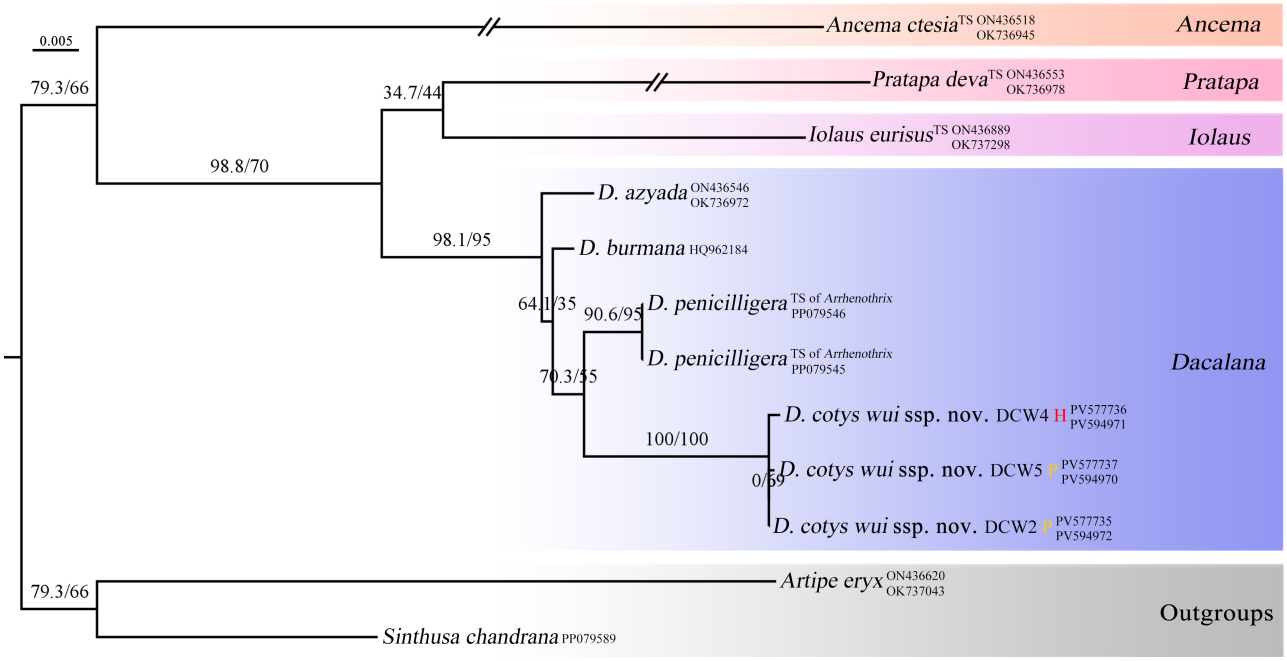

FIGURE 5. Phylogenetic tree of *Dacalana* inferred from ML analysis of *COI* and *EF-1α* with bootstrap support values (SHaLRT support/ultrafast bootstrap support). TS = Type species. All genera in which *D. cotys* was once placed are included. Mainly modified from Kawahara *et al.* (2023).

Acknowledgements

We would like to express our sincere gratitude to Messrs. Yutaka Inayoshi (Chiang Mai) and Hao Huang (Qingdao) for sending the photos and literature for this study. In addition, thanks are due to anonymous Mr. Liu for providing important information. Last but not least, thanks must go to the reviewers and editor for their valuable comments on the manuscript.

References

Bortamuly S & Dey R 2022: Butterfly checklist of Bongal Gaon village, including a sighting note of the globally rare *Liphyra brassolis* (Westwood, 1864) (Lepidoptera, Lycaenidae) from Upper Assam, India. *Cuadernos de Biodiversidad*, 63: 1–13. https://doi.org/10.14198/cdbio.20099

Bridges CA 1994: *Catalogue of the family-group, genus-group and species-group names of the Riodinidae & Lycaenidae (lepidoptera) of the world*. Published by the author, Urbana, 1200 pp. https://doi.org/10.5962/bhl.title.15814

Corbet AS 1938: A revision of the Malayan species of *Pratapa* Moore (Lepidoptera-Lycaenidae). *Proceedings of the Royal Entomological Society of London, Series B*, 7 (8): 166–172. https://doi.org/10.1111/j.1365-3113.1938.tb01272.x

D'Abrera B 1986: *Butterflies of the Oriental Region, Part III*. Hill House, Victoria, 672 pp.

de Nicéville L 1890: *The Butterflies of India, Burmah and Ceylon. Vol. III*. Calcutta Central Press Co., Ltd., Calcutta, 503 pp.

de Nicéville L 1894: On new and little-known butterflies from the Indo-Malayan region. *Journal of the Asiatic Society of Bengal*, 63 (2): 1–59.

Distant WL 1882–1886: *Rhopalocera Malayana: A Description of the Butterflies of the Malay peninsula*. W.L. Distant, London, 481 pp + 44 pls.

Eliot JN 1969: More revisional notes on Oriental Butterflies. *The Entomologist*, 102 (1279): 269–278.

Eliot JN 1973: The higher classification of the Lycaenidae (Lepidoptera): a tentative arrangement. *Bulletin of the British Museum (Natural History) Entomology*, 28 (6): 373–505 + pls. 1–6. https://doi.org/10.5962/bhl.part.11171

Eliot JN 1984: On some butterflies from Malaysia and Peninsular Thailand. *Malayan Nature Journal*, 38: 99–111.

Evans WH 1932: *The Identification of Indian Butterflies, 2nd edition revised*. The Bombay Natural History Society, Madras, 454 pp.

Fruhstorfer H 1912: Uebersicht der Lycaeniden des Indo-Australischen Gebiets. *Berliner Entomologische Zeitschrift*, 56: 197–272. https://doi.org/10.1002/mmnd.48019110816

Godfrey EJ 1919: On Butterflies collected by Malcolm A. Smith and C. Boden Kloss in Southern Annam. *The Journal of the Natural History Society of Siam*, 3 (4): 463–470.

Griffin FJ 1936: The contents of the parts and the dates of appearance of Seitz' Grossschmetterlinge der erde (the Macro-lepidoptera of the World), lieferungen 1 to 130 palaearctic and 1 to 575 exotic. Vols. 1 to 16, 1907–1935. *Transactions of the Royal entomological Society of London*, 85 (10): 243–279. https://doi.org/10.1111/j.1365-2311.1936.tb00232.x

Griffin FJ 1939: The "The Lepidoptera of Ceylon," Vols. 1–3, by F. Moore. 1880–1887. *Journal of the Society for the Bibliography of Natural History*, 1 (7): 206. https://doi.org/10.3366/jsbnh.1939.1.7.206

Gu M-B & Chen P-Z 1997: *Butterflies in Hainan Island*. China Forestry Publishing House, Beijing, 355 pp. [顾茂彬 & 陈佩珍 1997: 海南岛蝴蝶. 中国林业出版社, 北京, 355 pp.]

Gu M-B 2002: Lepidoptera: Rhopalocera. *In*: Huang FS (Ed) *Forest Insect of Hainan*. Science Press, Beijing, pp. 654–716. [顾茂彬 2002: 鳞翅目：锤角亚目. 见: 黄复生 (主编) 海南森林昆虫. 科学出版社, 北京, pp. 654–716.]

Gu M-B, Zhou Z & Chen D-X 2024: *A photographic Guide to the Butterflies of Hainan Tropical Rainforest National Park*. Guangdong Science & Technology Press, Guangzhou, 289 pp. [顾茂彬, 周璋 & 陈德祥 2024: 海南热带雨林国家公园蝶类图鉴. 广东科技出版社, 广州, 289 pp.]

Hajibabaei M, Janzen DH, Burns JM, Hallwachs W & Hebert PD 2006: DNA barcodes distinguish species of tropical Lepidoptera. *Proceedings of the National Academy of Sciences of the United States of America*, 103: 968–971. https://doi.org/10.1073/pnas.0510466103

Hemming F 1938: On the dates of publication of Hewitson (W. C.), 'Illustr. diurn. Lep. Lycaenidae,' 2 vols., 1863–1878. *Annals and Magazine of Natural History*, 10 (15): 117–120. https://doi.org/10.1080/00222933508654947

Hewitson WC 1863–1878: *Illustrations of diurnal Lepidoptera. Lycaenidae*. John Van Voorst, London, 228 pp + 100 pls.

Huang H 2022: Taxonomy and morphology of Chinese butterflies 2 Lycaenidae: Theclinae: Iolaini: Genera *Tajuria* Moore, 1881, *Pratapa* Moore, 1881, *Dacalana* Moore, 1884, *Maneca* de Nicéville, 1890, *Creon* de Nicéville, 1896 and *Bullis* de Nicéville, 1897 (Lepidoptera: Lycaenidae). *Atalanta*, 53 (1): 1–64.

Inayoshi Y 2024: *A Check List of Butterflies in Indo-China, Chiefly from Thailand, Laos & Vietnam*. Available from: http://yutaka.it-n.jp (accessed 15.III.2025)

Kandul NP, Lukhtanov VA, Dantchenko AV, Coleman JWS, Sekercioglu CH, Haig D & Pierce NE 2004: Phylogeny of *Agrodiaetus* Hübner 1822 (Lepidoptera: Lycaenidae) Inferred from mtDNA Sequences of *COI* and *COII* and Nuclear Sequences of *EF1-α*: *Karyotype Diversification and Species Radiation. Systematic Biology*, 53 (2): 278–298.

Kawahara AY, Storer C, Carvalho APS, Plotkin DM, Condamine F, Braga MP, Ellis EA, St Laurent RA, Li X, Barve V, Cai L, Earl C, Frandsen PB, Owens HL, Valencia-Montoya WA, Aduse-Poku K, Toussaint EFA, Dexter KM, Doleck T, Markee A, Messcher R, Nguyen Y-L, Badon JAT, Benítez HA, Braby MF, Buenavente PAC, Chan W-P, Collins SC, Childers RAR, Dankowicz E, Eastwood R, Fric ZF, Gott RJ, Hall JPW, Hallwachs W, Hardy NB, Hawkins Sipe RL, Heath A, Hinolan JD, Homziak NT, Hsu Y-F, Inayoshi Y, Itliong MGA, Janzen DH, Kitching IJ, Kunte K, Lamas G, Landis MJ, Larsen EA, Larsen TB, Leong JV, Lukhtanov V, Maier CA, Martinez JI, Martins DJ, Maruyama K, Maunsell SC, Mega NO, Monastyrskii A, Morais ABB, Müller CJ, Naive MAK, Nielsen G, Padrón PS, Peggie D, Romanowski HP, Sáfián S, Saito M, Schröder S, Shirey V, Soltis D, Soltis P, Sourakov A, Talavera G, Vila R, Vlasanek P, Wang H, Warren AD, Willmott KR, Yago M, Jetz W, Jarzyna MA, Breinholt JW, Espeland M, Ries L, Guralnick RP, Pierce NE & Lohman DJ 2023: A global phylogeny of butterflies reveals their evolutionary history, ancestral hosts and biogeographic origins. *Nature Ecology & Evolution*, 7 (6): 903–913. https://doi.org/10.1038/s41559-023-02041-9

Kimura Y, Aoki T, Yamaguchi S, Uémura Y & Saito T 2014: *The Butterflies of Thailand. Based on Yunosuke KIMURA Collection. Vol. 2: Lycaenidae*. Mokuyosha, Tokyo, 245 pp.

Kunte K, Sondhi S & Roy P (Eds) 2024: *Butterflies of India - Dacalana cotys (Hewitson, [1865])*. Available from: https://www.ifoundbutterflies.org/dacalana-cotys (accessed 15.III.2025)

Monteiro A & Pierce NE 2001: Phylogeny of *Bicyclus* (Lepidoptera: Nymphalidae) Inferred from COI, COII, and EF-1α Gene Sequences. *Molecular Phylogenetics and Evolution*, 18 (2): 264–281. https://doi.org/10.1006/mpev.2000.0872

Moore F 1880–1881: *The Lepidoptera of Ceylon. Vol. I*. L. Reeve & co, London, 190 pp + 71 pls. https://doi.org/10.5962/bhl.title.8801

Moore F 1884: Descriptions of some new Asiatic diurnal Lepidoptera; chiefly from specimens contained in the Indian Museum, Calcutta. *Journal of the Asiatic Society of Bengal*, 53 (2): 16–52.

Nguyen LT, Schmidt HA, von Haeseler A & Minh BQ 2015: IQ-TREE: a fast and effective stochastic algorithm for estimating maximum-likelihood phylogenies. *Molecular Biology and Evolution*, 32 (1): 268–274.

Osada S, Uémura Y & Uehara J 1999: *An Illustrated Checklist of the Butterflies of Laos P.D.R*. Mokuyo-sha, Tokyo, 240 pp.

Saito K & Inayoshi Y 2022: A revision of the *vidura* group of the genus *Dacalana* Moore, 1884. *Butterflies*, 88: 39–63.

Seitz A 1927: Genus: *Dacalana* Mr. *In*: Seitz A (Ed) *The Macrolepidoptera of the world, 9 (English Edition)*. Alfred Kernen, Stuttgart, pp. 970–971.

Singh IJ & Chib MS 2015: Checklist of Butterflies of Bhutan. *Journal of Bhutan Ecological Society*, 2: 22–58.

Tamura K, Stecher G & Kumar S 2021: MEGA11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution*, 38 (7): 3022–3027. https://doi.org/10.1093/molbev/msab120

Trifinopoulos J, Nguyen LT, Haeseler AV & Minh BQ 2016: W-IQ-TREE: a fast online phylogenetic tool for maximum likelihood analysis. *Nucleic Acids Research*, 44: W232–W235. https://doi.org/10.1093/nar/gkw256

Tytler HC 1915: Notes on some new and interesting butterflies from Manipur and the Naga Hills. Part III. *The Journal of the Bombay Natural History Society*, 24 (1): 119–155 + pls. III & IV.

van der Poorten GM & van der Poorten NE 2020: *The Butterflies of the Malay Peninsula (5th edition)*. Southdene Sdn. Bhd., Kuala lumpur, 492 pp + 138 pls. [originally by Corbet AS & Pendlebury HM]

Varshney RK & Smetacek P (Eds) 2015: *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Uttarakhand, 262 pp + 8 pls.

Wallace AR 1876: *The Geographical Distribution of Animals: with a study of the relations of living and extinct faunas as elucidating the past changes of the earth's surface*. Macmillan, London, 1110 pp. https://doi.org/10.5962/bhl.title.46581

Wang M, Liu J & Fu C-R 2020: *A Photographic Guide to the Butterflies of Yinggeling, Hainan*. Nan Hai Publishing Company, Haikou, 369 pp. [王敏, 刘季 & 符财瑞 2020: 海南鹦哥岭蝴蝶图鉴. 南海出版公司, 海口, 369 pp.]

Wang M & Fan X-L 2002: *Butterflies fauna sinica: Lycaenidae*. Henan Science and Technology Publishing House, Zhengzhou, 440 pp. [王敏 & 范晓琳 2002: 中国灰蝶志. 河南科学技术出版社, 郑州, 440 pp.]

Zhou Z, Gu M-B & Chen D-X 2022: *Butterflies of Jianfengling Hainan Tropical Rainforest National Park*. Guangdong Science & Technology Press, Guangzhou, 183 pp. [周璋, 顾茂彬 & 陈德祥 2022: 海南热带雨林国家公园尖峰岭蝴蝶. 广东科技出版社, 广州, 183 pp.]

Additional information

Author contributions: Resources: H-Z Liu, Z-J Wu and J-L Li. All others: H-Z Li.

Conflict of interest: The authors have declared that no competing interests exist.

Data availability: All of the data that support the findings of this study are available in the main text.

Ethical statement: No ethical statement was reported.

Funding: This study was self-funded by the authors.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of *ICE* and/or the editor(s). *ICE* and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.